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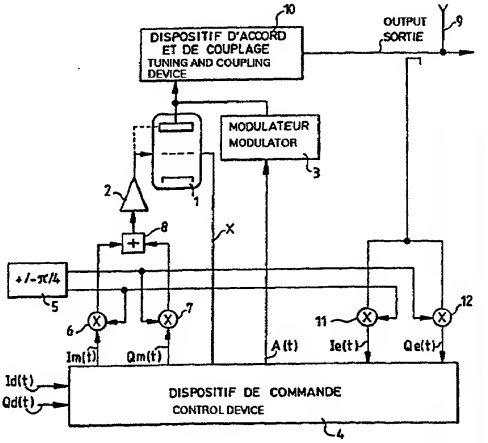
Publiée
Avec rapport de recherche internationale.

(54) **Title:** HIGH PERFORMANCE SHORT–WAVE BROADCASTING TRANSMITTER OPTIMISED FOR DIGITAL BROADCASTING

(54) **Titre:** EMETTEUR DE RADIODIFFUSION EN ONDES COURTES A HAUT RENDEMENT OPTIMISE POUR LES EMISSIONS DE TYPE NUMERIQUE

(57) **Abstract**

The invention concerns a transmitter comprising a power tube (1) whereof the gate is excited by a variable phase signal through an energizer (2) and whereof the anode is amplitude modulated by a modulator (3) output signal. The phase and amplitudes of the signals respectively applied on the tube (1) gate and anode are representative of the phase and amplitude of the complex signal to be transmitted. In order that the amplifying characteristic of the transmitter in its entirety remains linear independently of the amplitude of the signal to be transmitted, the energizer (2) has a linear amplifying characteristic for low amplitude levels of the signal to be transmitted and operates in saturated mode when the amplitude of the signal to be transmitted exceeds a predetermined threshold. The invention is applicable to short–wave transmitters.



(57) **Abrégé**

L'émetteur comprend un tube de puissance (1) dont la grille est excitée par un signal de phase variable au travers d'un dispositif d'excitation (2) et dont l'anode est modulée en amplitude par le signal de sortie d'un modulateur (3). La phase et l'amplitude des signaux appliqués respectivement sur la grille et l'anode du tube (1) son représentatifs de la phase et de l'amplitude du signal complexe à transmettre. Pour que la caractéristique d'amplification de l'émetteur dans son ensemble reste linéaire indépendamment de l'amplitude du signal à transmettre le dispositif d'excitation (2) présente une caractéristique d'amplification linéaire pour les faibles amplitudes du signal à transmettre et travaille en régime saturé lorsque l'amplitude du signal à transmettre dépasse une valeur de seuil déterminée. Applications: Emetteurs ondes courtes.

FORM PTO-1390 (Modified) (REV 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR
211319US2PCT	09/868918

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/FR00/00009	05 JANUARY 2000	12 JANUARY 1999

TITLE OF INVENTION

SHORT WAVE HIGH EFFICIENCY RADIO BROADCASTING TRANSMITTER FOR DIGITAL TRANSMISSIONS

APPLICANT(S) FOR DO/EO/US

Pierre-Andre LAURENT

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☐ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

Request for Consideration of Documents in International Search Report
Notice of Priority / PCT/IB/304 / PCT/IB/308
Drawings (4 sheets)

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/868918	PCT/FR00/00009	211319US2PCT

24. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :	CALCULATIONS PTO USE ONLY
☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $1000.00	
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CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	4 - 20 =	0	x $18.00	$0.00
Independent claims	1 - 3 =	0	x $80.00	$0.00
Multiple Dependent Claims **(check if applicable).**			☒	$270.00
TOTAL OF ABOVE CALCULATIONS =				$1,130.00
☐ Applicant claims small entity status. (See 37 CFR 1.27). The fees indicated above are reduced by 1/2.				$0.00
SUBTOTAL =				$1,130.00
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Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐				$0.00
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SEND ALL CORRESPONDENCE TO:

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Marvin J. Spivak
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24,913
REGISTRATION NUMBER

July 11 2001
DATE

Short wave high efficiency radio broadcasting transmitter for digital transmissions

This invention relates to a high efficiency radio-broadcasting transmitter optimized for digital type transmissions. It is applicable particularly to short wave radio broadcasting transmissions.

Radio broadcasting transmitters used at the present time for short wave transmissions are optimized to have a very high efficiency during transmission in pure amplitude modulation with carrier residue.

In order to achieve this, they are organized around a high power tube acting essentially as a current switcher at the rate of a carrier wave to be transmitted. A high voltage signal proportional to the instantaneous amplitude of the high frequency wave to be transmitted is applied to the anode tube through the output from a modulator. Modulations used at the present time are known as abbreviations IML and PSM.

With new digital radio broadcasting systems currently being standardized, the transmitted wave shape is not related to the audio frequency signal to be transmitted. It is of the type that is used in serial or parallel modulators. The binary stream that is transported depends on the coding of the audio frequency signal that is done on the input side, and the data that accompany it. The purpose of the process is to significantly improve the intrinsic reception quality of audio frequency signals and to make them insensitive to unwanted effects that occurred during propagation and are due mainly to fading, noise and interference phenomena, provided that they remain limited to reasonable values.

Another advantage of the process is that there is no need to transmit a carrier wave, although the carrier wave represents up to 90% of the total transmitted power in amplitude modulation transmitters. Furthermore, with a digital modulation process with a serial or parallel modulator, the transmitted signal is modulated both in amplitude and in phase. It is a complex signal, usually described by the relation $S(t)=I(t) + j\ Q(t)$, where $I(t)$ is the phase signal and $Q(t)$ is the quadrature signal. This makes it possible to consider using a conventional amplitude modulation transmitter in which a frequency reference is modulated in phase and in which the input audio frequency signal is proportional to the modulus of the complex signal to be transmitted.

Tests carried out up to now on this type of transmitter show that although the transmitted signal quality can be considered as being sufficient for reception, it is

insufficient for an operational system that will need to cohabit with other transmitters, regardless of whether they are amplitude or digital modulation signals.

Even if the precaution of transmitting a carrier residue is taken in order to make operation of transmitter performances linear in terms of distortion, pass band and neutralization, the result is that the parasite transmissions in channels adjacent to the channels used by the transmitter are too high.

Defects with this type of transmitter are essentially due to the fact that the signal to be transmitted has all the characteristics of Gaussian or quasi Gaussian noise at its usual location, in other words close to the origin for $I = 0$ and $Q = 0$, whereas this is precisely the location at which difficulties are greatest.

The phase varies fastest when the signal passes close to the origin, which automatically makes it necessary to have a wide passband for the phase modulated channel.

Furthermore, there are also sharp direction changes in the amplitude channel close to the origin, which also need a wide passband of the amplitude channel, typically equal to at least three times the bandwidth of the transmitted signal.

However, the main concern of transmitter manufacturers is efficiency, which is usually given priority over linearity and phase distortion due to the approximate neutralization of the output tube.

Therefore the problem with the transmission of a digital type signal cannot be solved by simply adding control signals on existing transmitters. It requires the design of appropriate transmitters, however their efficiency must be acceptable for the operator and they must also be able to continue to transmit in pure amplitude modulation if necessary, in at least one transient phase.

For example, it would be possible to consider solving this problem when using a class A transmitter, in other words for which the transmission tube operates under unsaturated conditions, or to use the solution of transmitters known as DOHERTY transmitters.

A class A transmitter may be considered as being a pure amplifier in which the input is modulated by a low level high frequency signal and that outputs a high level replica of the input signal on its output, that is directly injected into the transmitter antenna system.

Unfortunately, apart from its deplorable efficiency of between 20 and 25% maximum, this system cannot be used for the main reason that there is no power tube

within the useable 100 kW class, since the tubes are optimized to operate in class C in which energy efficiency is optimal.

DOHERTY type transmitters use two coupled tubes operating in a high efficiency mode. For illustration, a 90 kW transmitter of this type marketed by RCA is still in operation in the Vatican radio broadcasting station. This transmitter comprises two symmetric phase modulated tubes, and an output formed by a combination of the outputs from the two tubes which is exclusively amplitude modulated, however with a residual phase modulation that is not perceptible to existing receivers on the market. In this case too, this assembly is dedicated to radio broadcasting in amplitude modulation with carrier residue. But economically it is not very attractive, since it requires the use of two transmitter output power tubes.

The concept on which the invention is based is to agree to reduce the global efficiency of the transmitter for low amplitude signals while maximizing efficiency for higher amplitude signals which cause a greater energy consumption.

This objective is achieved by modifying the excitation device of the transmitter power tube grid such that the behavior of the transmitter is variable as a function of the signal level applied to the transmitter input.

According to the invention, the excitation device behaves like a simple linear amplifier when the signal to be transmitted is low amplitude, and works in saturated mode when the amplitude of the signal to be transmitted is significant.

Under these conditions, the operating point of the transmitter power tube and its anode voltage are adjusted such that:

- at low amplitudes, the anode voltage is constant and is not too weak so that the power tube operates linearly or quasi-linearly, behaving like an amplifier of the output signal from the excitation device which also acts like an amplifier,
- at higher amplitudes, the anode voltage is modulated proportionally to the modulus of the signal to be transmitted.

The purpose of the invention is to use a transmitter satisfying these criteria.

Consequently, the purpose of the invention is a digital signals radio broadcasting transmitter comprising a power tube in which the grid is excited by a variable phase signal through an excitation device and in which the anode is amplitude modulated by the modulator output signal, the phase and amplitude of the signals applied to the grid and the anode of the tube respectively being representative of the phase and amplitude of a complex signal to be transmitted, characterized in that the excitation device has a

linear amplification characteristic for low signal amplitudes to be transmitted and operates under saturated conditions when the signal amplitude to be transmitted exceeds a given threshold value, such that the amplitude characteristic of the transmitter as a whole remains linear independently of the amplitude of the signal to be transmitted.

The main advantage of the transmitter according to the invention is that it is simple to apply and only modifies the exciter of the power tube of standard transmitters if the power tube is not sufficiently linear.

Another advantage is that it provides a simple solution to the requirement for linearity of the transmitter for low level signals applied to the transmitter input, the operating point of the output tube being displaced such that the amplification of the output tube is linear or quasi-linear.

In principle, the global efficiency of the transmitter remains high since most of the time it works in the same way as in conventional solutions, in other words like a switch. The efficiency only also starts to drop when the power consumed is low.

Constraints on the passband of the amplitude modulator are lower since the amplitude of the output signal always keeps a minimum determined value and does not have any sharp direction changes widening the pass band.

The same is true for the exciter input modulator that no longer needs a wide passband, since its amplitude is very low or even zero when the signal passes close to the origin.

Another advantage is that the approximate linearity of the transmission system, both in amplitude and in phase, may easily be corrected after an initial and possibly periodic calibration phase to determine the exact values of the Im(t), Qm(t) and A(t) signals to be sent to the complex exciter input modulator and to the amplitude modulator.

Finally, the transmitter according to the invention can transmit any wave shape from pure digital to standard amplitude modulation, including hybrid versions simultaneously transmitting arbitrary proportions of the pure digital signal, the carrier residue with an arbitrary level and frequency, analog audio frequency signal in amplitude modulation, in single side band or in attenuated side band.

Other characteristics and advantages of the invention will become clear after reading the following description with reference to the attached drawings that represent:

Figure 1 shows the principle used in the invention to transform a transmitter transmitting in amplitude modulation into a transmitter transmitting digital signals,

Figure 2 is a graph representing a signal transmission with several amplitude and phase states, by a transmitter according to that shown in Figure 1,

Figure 3 shows an embodiment of a transmitter according to the invention,

Figure 4 contains graphs describing the amplitude of the output from the exciter used in the invention, and the amplitudes of the modulator output voltage and the voltage applied to the anode of the output tube as a function of the amplitude of the signal to be transmitted,

Figures 5 and 6 of the amplitude and phase spectra of the signal obtained at the output from a transmitter conform with that shown in Figure 3.

The transmitter shown in Figure 1 comprises a power tube 1, the grid of which is excited by an excitation device 2, and the anode of which is modulated in amplitude by a modulator 3. A control device 4 generates the signals necessary for phase control of the excitation device 2 and amplitude control of the modulator 3 starting from the real component I(t) and the imaginary component Q(t) of the complex signal to be transmitted.

Phase modulation of the grid of tube 1 is achieved starting from the sine and cosine of the phase angle ϕ calculated by the conversion device 4 and applied to the first operand inputs of the multiplier circuits 6 and 7. Second operand inputs of the multiplier circuits 6 and 7 also receive two sinusoidal signals with constant amplitude and with a frequency equal to the frequency supplied by the synthesizer 5, but for which the phases can be shifted by 90° with respect to each other. An adder circuit 8 adds signals obtained at the output from the two multiplier circuits 6 and 7 to apply a signal $S(t) = \exp(j\phi 1)$ to the grid of tube 1 through the exciter 2, where $\phi 1 = \phi + \omega t$, and $\omega = 2\pi f$, where f is the frequency of the synthesizer 5.

The amplitude modulation of the anode of tube 1 is obtained by applying a signal A_1 proportional to the modulus of the complex signal to be transmitted through modulator 3, defined by the relation:

$$A_1 = (I_{(t)}^2 + Q_{(t)}^2)^{1/2}$$

Considering linear amplification of tube 1 in an ideal case, the combined action of the excitation device 2 and the modulator 3 must produce a signal $S_1(t)$ defined by the following relation on the anode of tube 1:

$$S_1(t) = A_1 S(t)$$

The signal $S_1(t)$ is then applied to a transmission antenna 9 through a matching device and coupling device 10.

However in practice, the signal obtained on the anode of tube 1 has large distortions particularly due to low amplitudes compared with the signal applied to the transmitter input. This is partly due to non-linearity of the amplification curve of tube 1 that is polarized in class C and the fact that the excitation device and tube 1 both act like switches in order to obtain a very good efficiency. The signal phase varies most quickly at low amplitudes close to zero values of the imaginary parts I and Q of the complex signal to be transmitted, which makes it necessary to have a very wide pass band of the phase modulated channel. It is also close to the origin that the amplitude modulation of the tube has the largest number of sharp direction changes which also require a wide passband of the amplitude channel, typically at least three times the band width of the transmitted signal.

Furthermore, parasite capacitances between the anode and the grid of the power tube introduce an additional phase shift that depends on the output amplitude from the power tube 1. The result is distortions like those shown in figure 2, in the case of a transmission of a complex signal with several regularly spaced amplitude and phase states.

In order to solve these difficulties, the transmission device shown in figure 3 behaves like the device shown in figure 1 in which corresponding elements are shown with the same references, a power tube 1 for which the grid is excited by an excitation device 2 and for which the anode is modulated in amplitude by a modulator 3. The excitation device 2 and the modulator 3 are controlled by a control device 4. The only difference between the transmission device shown in figure 3 and the transmission device shown in figure 1 is the excitation device 2 for which the characteristic is practically linear at low level of the signal to be transmitted and operates in saturation for higher levels, the polarization of the tube 1 and the presence of a complex local demodulator composed of two multiplier circuits 11 and 12 coupled to the transmitter output to estimate the components $I_e(t)$ and $Q_e(t)$ of the transmitted signal, and by the presence of a signal processor, not shown, arranged on the inside the control device 4 to control the excitation device 2 as a function of the result that it obtains by comparing the real and imaginary amplitudes respectively of the signal to be transmitted and of the signal actually transmitted to slave the transmitted signal to the signal to be transmitted applied to the input of the transmitter. Depending on this result, the control device 4

firstly outputs the real part I_m and the imaginary part Q_m of a complex signal $I_m + j\ Q_m$ to the operand input of two multiplier circuits 6 and 7, and secondly applies a signal A(t) representing its modulus at the input of the modulator 3.

In these calculations, the amplitude A(t) of the signal applied to the input of modulator 3 is determined by a relation in the following form:

$$A(t) = (A_0^{2n} + (I_m^2 + Q_m^2)^n)^{1/2n}$$

For n=1 A(t) becomes

$$A(t) = (A_0^2 + (I_m^2 + Q_m^2)^n)^{1/2}$$

and the phase angle ϕ is determined by the relation

$$e^{j\phi} = (I_m + j\ Q_m) / (I_m^2 + Q_m^2)$$

The control device 4 also determines a signal X polarizing the grid of tube 1 that is determined as a function of the amplitude of the complex signal $I_d(t) + Q_d(t)$ of the signal to be transmitted.

Figure 4 shows the amplitude h(A) of the signal obtained at the output from the excitation device 2, the amplitude g(A) of the modulation signal applied to the anode of the power tube 1, and the amplitude X = f(a) representative of the polarization voltage of the grid of tube 1, as a function of the amplitude A(t) of the signal to be transmitted. For low modulation signal amplitudes A(t), the grid polarization is positive and the anode polarization is close to A_0 which makes the power tube 1 conducting, whereas for modulation signal amplitudes greater than a determined threshold value, the polarization voltage of the grid becomes negative and the power tube then operates in a switching condition at the modulation rate.

The effect of this is that as soon as the anode voltage exceeds a determined value, the efficiency of the transmitter is very high and for amplitudes below this value, the efficiency of the transmitter is authorized to have correspondingly low values when the amplitude of the output signal itself is low, which is not annoying since in this case the consumed power is low.

The curve shown in a bold line represents the amplitude at the transmitter output.

The impact on the amplitude and phase of the signal spectrum is shown in figures 5 and 6.

CLAIMS

1. Digital signals radio broadcasting transmitter comprising a power tube (1) in which the grid is excited by a variable phase signal through an excitation device (2) and in which the anode is amplitude modulated by the output signal from a modulator (3), the phase and amplitude of signals applied on the grid and anode of the tube (1) respectively being represented by the phase and amplitude of a complex signal to be transmitted, characterized in that the excitation device (2) has a linear amplification characteristic for low amplitudes of the signal to be transmitted and operates under saturated conditions when the amplitude of the signal to be transmitted exceeds a determined threshold value, so that the amplification characteristic of the transmitter as a whole remains linear independently of the amplitude of the signal to be transmitted.

2. Transmitter according to claim 1, characterized in that it comprises a control device (4) to apply a low and approximately constant polarization voltage to the anode of the tube (1) for low amplitude signals to be transmitted with a value below a given threshold value, and to modulate the anode voltage proportionally to the modulus of the signal to be transmitted at signal amplitudes to be transmitted higher than the determined threshold value.

3. Transmitter according to any one of claims 1 and 2, characterized in that the tube (1) operates in linear amplification mode for which it is conducting when the amplitude of the signal to be transmitted is below the given threshold value and operates as a switch when the amplitude of the signal to be transmitted is higher than the given threshold value.

ABSTRACT OF THE DISCLOSURE

Short wave high efficiency radio broadcasting transmitter
for digital transmissions

The transmitter comprises a power tube (1) in which the grid is excited by a variable phase signal through an excitation device (2) and in which the anode is amplitude modulated by the output signal from a modulator (3). The phase and amplitude of signals applied to the grid and anode of the tube (1) respectively representing the phase and amplitude of the complex signal to be transmitted. The amplification characteristic of the excitation device (2) remains linear for low amplitudes of the signal to be transmitted and operates under saturated conditions when the amplitude of the signal to be transmitted exceeds a given threshold value, so that the amplification characteristic of the transmitter as a whole remains linear independently of the amplitude of the signal to be transmitted.

Applications: short wave transmitters.

Figure 3.

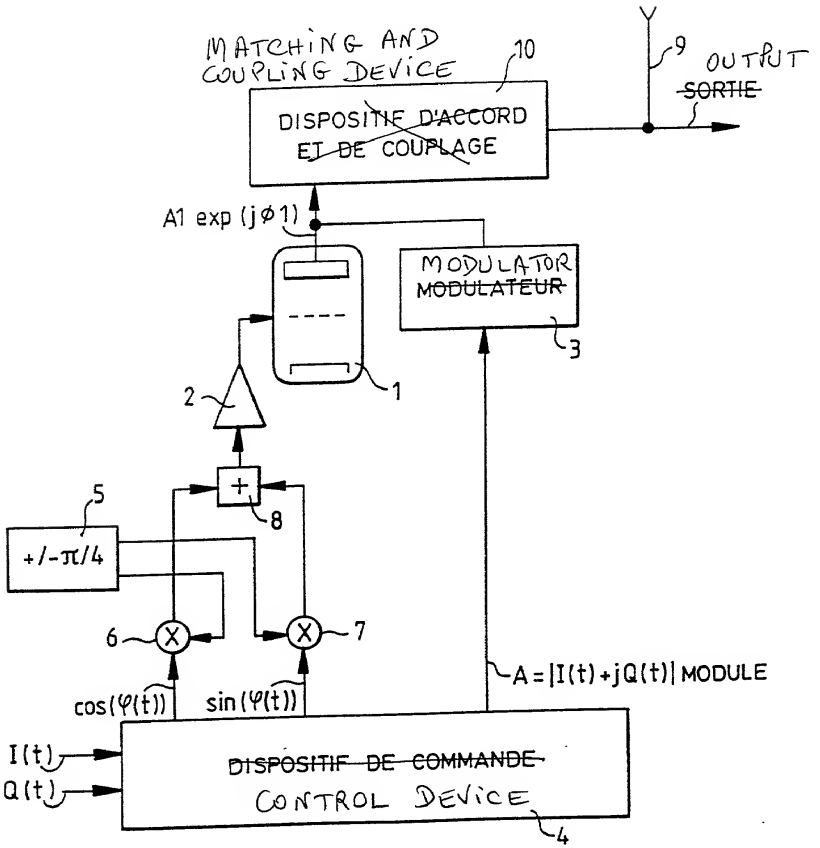

MATCHING AND COUPLING DEVICE
10
DISPOSITIF D'ACCORD ET DE COUPLAGE
9
OUTPUT
SORTIE
A1 exp (jφ1)
MODULATOR
MODULATEUR
3
1
2
+
8
5
+/-π/4
6
7
cos(φ(t))
sin(φ(t))
A = |I(t) + jQ(t)| MODULE
I(t)
Q(t)
DISPOSITIF DE COMMANDE
CONTROL DEVICE
4

FIG.1

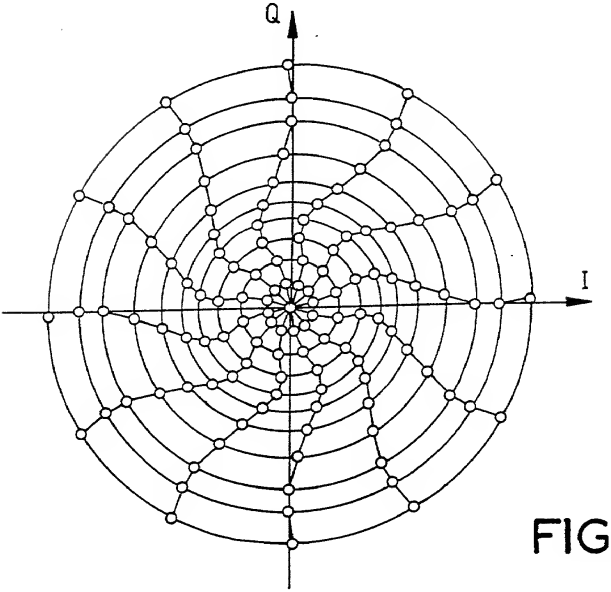


FIG. 2

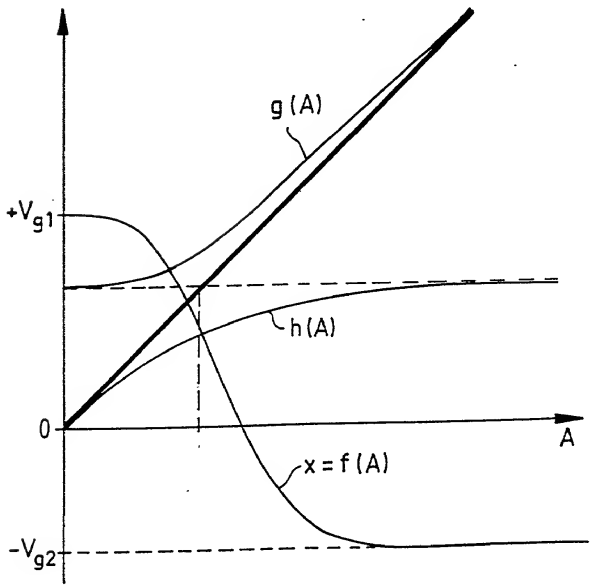
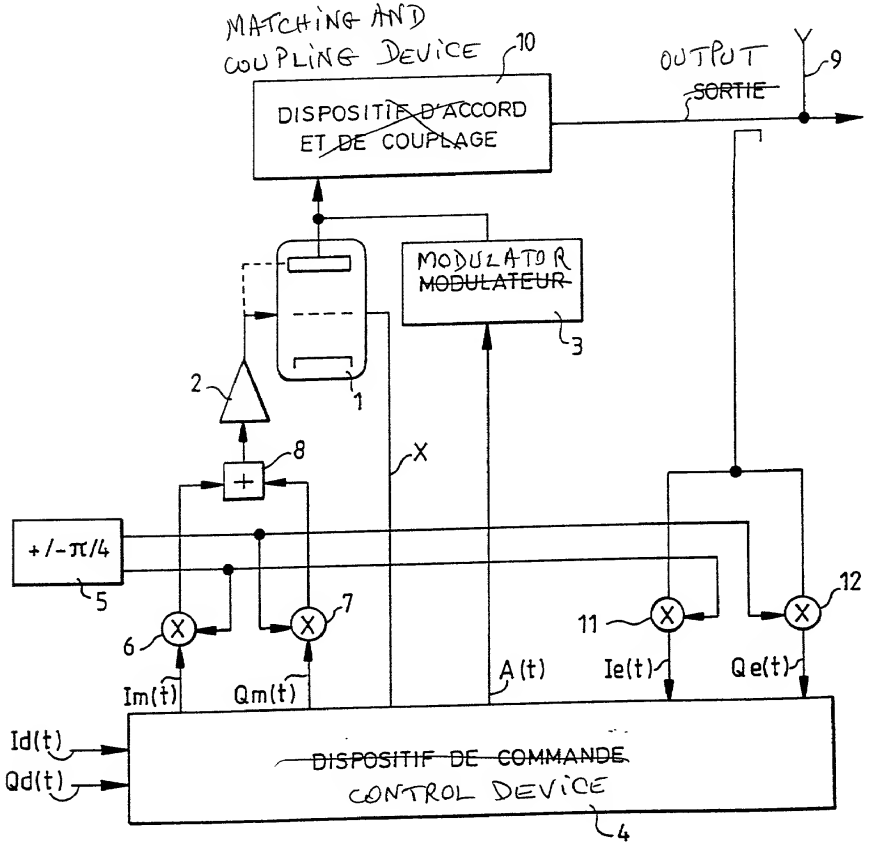


FIG. 4


MATCHING AND
COUPLING DEVICE
10
DISPOSITIF D'ACCORD
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OUTPUT
SORTIE
9
MODULATOR
MODULATEUR
3
2
1
8
X
+/-π/4
5
6
7
11
12
A(t)
Ie(t)
Qe(t)
Im(t)
Qm(t)
Id(t)
Qd(t)
DISPOSITIF DE COMMANDE
CONTROL DEVICE
4

FIG.3

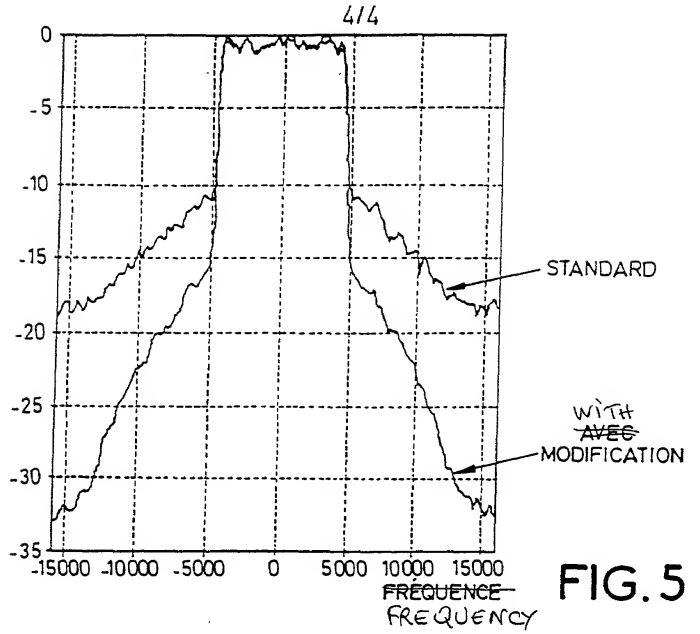

FIG. 5

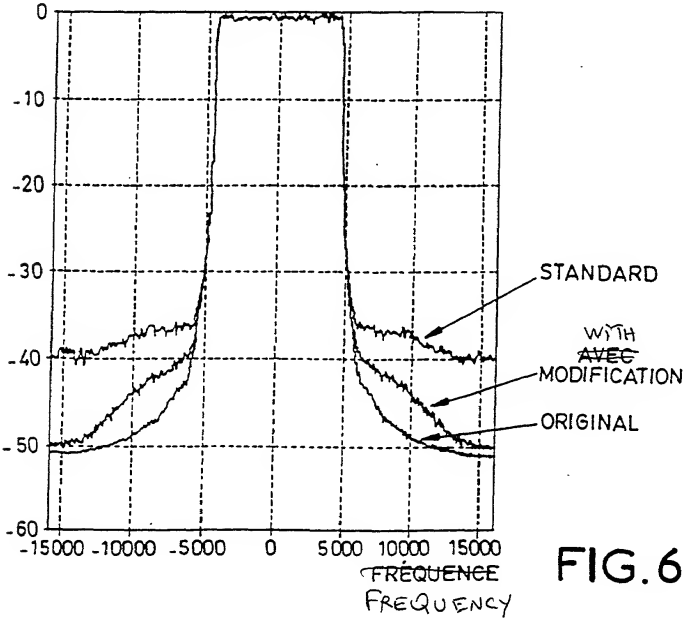

FIG. 6

Declaration and Power of Attorney for Patent Application
Déclaration et Pouvoirs pour Demande de Brevet

French Language Declaration

En tant l'inventeur nommé ci-après, je déclare par le présent acte que:

As a below named inventor, I hereby declare that:

Mon domicile, mon adresse postale et ma nationalité sont ceux figurant ci-dessous à côté de mon nom.

My residence, post office address and citizenship are as stated next to my name.

Je crois être le premier inventeur original et unique (si un seul nom est mentionné ci-dessous), ou l'un des premiers co-inventeurs originaux (si plusieurs noms sont mentionnés ci-dessous) de l'objet revendiqué, pour lequel une demande de brevet a été déposée concernant l'invention intitulée

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

_____

_____

_____

SHORT WAVE HIGH EFFICIENCY RADIO BROADCASTING TRANSMITTER FOR DIGITAL TRANSMISSIONS

et dont la description est fournie ci-joint à moins

the specification of which:

☐ ci-joint

☐ a été déposée le _____

sous le numéro de demande des Etats-Unis ou le numéro de demande international PCT

_____ et modifiée le

_____ (le cas échéant).

☐ is attached hereto.

☒ was filed on 5 January 2000

as United States Application Number or PCT International Application Number

PCT/FR00/00009 and was amended on

_____ (if applicable).

Je déclare par le présent acte avoir passé en revue et compris le contenu de la description ci-dessus, revendications comprises, telles que modifiées par toute modification dont il aura été fait référence ci-dessus.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

Je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

French Language Declaration

Je revendique par le présent acte avoir la priorité étrangère, en vertu du Titre 35, § 119(a)-(d) ou § 365(b) du Code des Etats-Unis, sur toute demande étrangere de brevet ou certificat d'inventeur ou, en vertu du Titre 35, § 365(a) du même Code, sur toute demande internationale PCT désignant au moins un pays autre que les Etats-Unis et figurant ci-dessous et, en cochant la case, j'ai aussi indiqué ci-dessous toute demande étrangère de brevet, tout certificat d'inventeur ou toute demande internationale PCT ayant une date de dépôt précédant celle de la demande à propos de laquelle une priorité est revendiquée

I hereby claim foreign priority under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below, and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)
Demande(s) de brevet antérieure(s) dans un autre pays.

(Number) (Numéro)	(Country) (Pays)	(Day/Month/Year Filed) (Jour/Mois/Anné de dépôt)	Priority claimed Droit de priorité revendiqué: Yes Oui	No Non
99 00240	FRANCE	12 January 1999	☒	☐
			☐	☐

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 119(e) du Code des Etats-Unis, de toute demande de brevet provisoire effectuée aux Etats-Unis et figurant ci-dessous

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below

(Application No.) (Nº de demande)	(Filing Date) (Date de dépôt)	(Application No.) (Nº de demande)	(Filing Date) (Date de dépôt)

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 120 du Code des Etats-Unis, de toute demande de brevet effectuée aux Etats-Unis, ou en vertu du Titre 35, § 365(c) du même Code, de toute demande internationale PCT désignant les Etats-Unis et figurant ci-dessous et, dans la mesure où l'objet de chacune des revendications de cette demande de brevet n'est pas divulgué dans la demande antérieure américaine ou internationale PCT, en vertu des dispositions du premier paragraphe du Titre 35, § 112 du Code des Etats-Unis, je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations, dont j'ai pu disposer entre la date de dépôt de la demande antérieure et la date de dépôt de la demande nationale ou internationale PCT de la présente demande:

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application No.) (Nº de demande)	(Filing Date) (Date de dépôt)	(Status) (patented, pending, abandoned) (Statut) (breveté, en cours d'examen, abandonné)
PCT/FR00/00009	5 January 2000	

Je déclare par le présent acte que toute déclaration ci-incluse est, à ma connaissance, véridique et que toute déclaration formulée à partir de renseignements ou de suppositions est tenue pour véridique, et de plus, que toutes ces déclarations ont été formulées en sachant que toute fausse déclaration volontaire ou son équivalent est passible d'une amende ou d' une incarcération, ou des deux, en vertu de la Section 1001 du Titre 18 du Code des Etats-Unis, et que de telles déclarations volontairement fausses risquent de compromettre la validité de la demande de brevet ou du brevet délivré à partir de celle-ci.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

French Language Declaration

POUVOIRS. En tant que l'inventeur cité, je désigne par la présente l'(les) avocat(s) et/ou agent(s) suivant(s) pour qu'ils poursuive(nt) la procédure de cette demande de brevet et traite(nt) toute affaire s'y rapportant avec l'Office des brevets et des marquees *(mentionner le nom et le numéro d'enregistrement)*

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: *(list name and registration number)*

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	French
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	95550 BESSANCOURT FRANCE
Nom complete du second co-inventeur, le cas echeant	Full name of second joint inventor, if any
Signature de l'inventeur Date	Second inventor's signature Date
Domicile	Residence
Nationalité	Citizenship
Adresse Postale	Post Office Address

(Fournier les mêmes renseignements et la signature de tout co-inventeur supplémentaire)

(Supply similar information and signature for third and subsequent joint inventors)